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THE INCLUSION OF TAGGED AMINO ACIDS LYSINE 14C AND GLYCINE 14C IN SOLUBLE AND INSOLUBLE LUNG PROTEINS DURING EXPERIMENTAL BERYLLIOSIS

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THE INCLUSION OF TAGGED AMINO ACIDS LYSINE ^{14}C AND GLYCINE ^{14}C IN SOLUBLE AND INSOLUBLE LUNG PROTEINS DURING EXPERIMENTAL BERYLLIOSIS

Most authors associate the mechanism involved in the effect of beryllium with the effect on tissue protein. We deemed it desirable to study certain aspects of the metabolism of lung proteins during experimental berylliosis.

Procedure. Experimental berylliosis was caused in 200 gram male rats by one endotracheal injection of 5 mg of beryllium oxide in 1 milliliter of an 0.85% solution of NaCl. The animals were put to death after 1, 3, 14, 30, and 60 days. Each group had a physiological control.

Lysine ^{14}C and glycine ^{14}C were injected subcutaneously on the basis of 5000 ppg [pulses/gram] of weight 2-1/2 hours prior to the animals being put to death. The animals were given a mild dose of ether, after which the blood was let from the heart. Blood was washed out of the lung by a chilled 0.85% solution of NaCl through the pulmonary artery and the homogenate was prepared from 1.5 to 2 grams of lung tissue and 5 milliliters of the same solution. The soluble proteins (separated using O. B. Kuzovleva's method) and the residue remaining after centrifuging the insoluble proteins in aqueous solutions, were precipitated out by 10% trichloroacetic acid. The radioactivity of the proteins (in pulses per minute per 20 milligrams of dry protein) was counted using an end-window counter in the thick layer (S. E. Shnol'). The effective layer was 20 mg.

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(Submitted 26 January 1968)

Results. As may be seen from the following table, the inclusion of lysine ^{14}C in the insoluble lung proteins increased within 24 hours, and rose during the succeeding periods of the research (the maximum by the 14th day was 74%). The radioactivity of the insoluble lung proteins fell somewhat a month after the injection of beryllium oxide, and by the end of 2 months the magnitude of the lysine inclusion in the insoluble proteins approached the control level.

Investigations made using glycine ^{14}C inclusion for the period of maximum changes, 2 weeks, also showed an increase in the inclusion of the tag of 80% as compared to the norm.

Increase in the inclusion of ^{14}C in the insoluble proteins was commensurate with the increase in the dry weight of the lungs.

Inclusion of Lysine ^{14}C in Insoluble Lung Proteins

1 Время после введения окиси бериллия (в сутках)	2 Группа				
	3 контрольная		4 опытная		
	5 число животных	6 число импульсов на 20 мг белка	5 число животных	6 число импульсов на 20 мг белка	P
1	8	213±9,9	7	300±12,9	<0,01
3	8	213±9,9	7	366±20,6	<0,01
14	8	213±9,9	6	382±10,2	<0,01
30	10	216±5,7	7	333±21,2	<0,01
60	7	205±5,4	8	240±10,2	<0,02

Commas represent decimal points.

1 - Time after injection of beryllium oxide (days); 2 - Group; 3 - Control; 4 - Experimental; 5 - No. animals; 6 - No. pulses per 20 mg protein.

Increase in the inclusion of lysine in the soluble proteins also will be seen on the days following the injection of beryllium oxide, but the increase is considerably smaller than the increase in the inclusion of lysine

in the insoluble proteins. This is followed by an increase in the tag inclusion process as a result of the development of the illness. The increase is 33% in 14 days, as compared to the control. The maximum increase in the radioactivity of the soluble lung proteins is found to occur 30 days after dusting, at which point it was 56% greater than in the control. It remained quite high at the 60 day point as well. The inclusion of glycine ^{14}C in the soluble lung proteins was 40% higher than in the control on the 14th day.

Conclusion. The increase in the inclusion of tagged amino acids in the insoluble lung proteins of test rats apparently is attributable to the increase in the synthesis of these proteins. The significant increase in the dry weight of the lungs, coinciding in time with the high inclusion of lysine in the insoluble proteins, is an indication that favors this fact. The conclusion derived from the description of the pathological picture (I. N. Potanova), in which proliferation of the cellular elements and the appearance of collagenous fibers may be noted from the first day of development of experimental berylliosis, is that the protein development process in the lungs is an intensive one. Lysine and glycine, used in our experiment, along with proline and oxyproline, are the basic amino acids from which collagen forms (Chvapil and Huryc'h). Increase in the inclusion of tagged amino acids can take place when there is a change in the conformation properties of the protein as a result of a disruption in protein synthesis, or as a result of different denaturation and prenaturation changes in the proteins (A. G. Pasynskiy et al.).

It is much more difficult to explain the increase in the inclusion of tagged amino acids in the soluble lung proteins observed in our experiments

by the increase in the synthesis of these proteins because the soluble proteins rapidly lose their high radioactivity, something that implies a weak bond with the amino acid. The increase in the inclusion of tagged amino acids in the soluble proteins is delayed as compared with the increase in the dry weight of the lungs, but coincides in time with the antigenic rearrangement in the lung tissue.

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[Vklyucheniye mechenykh aminokislot lizine-C^{14} i glitsina-C^{14} v rastvorimyye i nerastvorimyye belki legkogo pri eksperimental'nom berillioze]

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